

بسم الله الرحمن الرحيم

KUMPULAN RINGKASAN PENELITIAN MAHASISWA INDONESIA DI KING SAUD UNIVERSITY



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2012 - 2013

Nama : Sutrisno W. Ibrahim
Jurusan : Electrical Engineering
Jenjang Studi : S-2 (Master)
Tahun Kelulusan : 2013
Judul Penelitian : Autonomous Frequency Tracking for Piezoelectric Energy Harvester

Ringkasan Penelitian :

Piezoelectric energy harvesting technologies received a great attention during the last decade to design self-powered devices such as: wireless sensors, wireless actuators, and small/portable devices. Piezoelectric energy harvester (PEH) is an electromechanical device to convert vibration energy into electrical energy. The maximum power transfer occurs when the harvester natural frequency matches the vibration frequency. Deviations from the resonance cause significant decrease in the power output. The main objective of this thesis is to design and practically implement an autonomous frequency tracker for PEH. Using an autonomous frequency tracker, the harvester is able to adapt its properties according to the given environmental conditions. PEH with autonomous frequency tracker has better performance than simple one, especially when the vibration frequency far away from the original natural frequency. The harvester bandwidth increases up to 55%.

Publikasi :

- ✓ Sutrisno W. Ibrahim and Wahied G. Ali, "A Review on Frequency Tuning Methods for Piezoelectric Energy Harvesting Systems," *Journal of Renewable and Sustainable Energy*, Vol. 4, pp. 062703 (2012); doi: 10.1063/1.4766892 (ISI journal)
- ✓ Wahied G. Ali, and Sutrisno W. Ibrahim, "Power Analysis for Piezoelectric Energy Harvester," *Energy and Power Engineering*, Vol. 4, Issue 6 (2012). pp. 496-505. doi: 10.4236/epe.2012.46063.
- ✓ Sutrisno W. Ibrahim, and Wahied G. Ali, "Power Enhancement for Piezoelectric Energy Harvester," *Proceedings of The World Congress on Engineering (WCE) 2012*, pp1018-1023 (July 4 - 6, 2012, London, U.K).
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and Application (ICSEEA) 2012 (November 6 - 8, 2012, Yogyakarta, Indonesia).

- ✓ Wahied G. Ali, Sutrisno W. Ibrahim, and Ahmad Telba, “Modeling and Simulation of Vulture Piezoelectric Energy Harvester,” *International Conference on Computer Engineering & Systems (ICCES'2012)* (November 27-29, 2012, Cairo, Egypt).

Link: <http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6408517>

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Nama : Meilana Dharma Putra
 Jurusan : Chemical Engineering
 Jenjang Studi : S-2 (Master)
 Tahun Kelulusan : 2010 (saat ini sedang menempuh S-3 di jurusan yang sama)
 Judul Penelitian : Oxidative Dehydrogenation of Propane to Propylene
 Ringkasan Penelitian :

Propylene is the most important light olefins used in the production of plastics, fibers, lubricants, films, textiles, pharmaceuticals, etc. Catalytic oxidative dehydrogenation (ODH) of propane to propylene stands as a promising alternative to steam cracking and catalytic dehydrogenation, because the presence of oxygen lowers energy requirements and eliminates the need for catalyst regeneration. However, in general, obtaining high yield with high olefins' selectivity is still difficult due to tendency towards further oxidation. We has studied this issue, in which the presence of strontium in V-Mo catalyst enhanced the performance of the catalyst, i.e., increased conversion and selectivity, decreased reducibility of the catalyst and improved its stability. In another contribution, the improved catalyst performance has been confirmed further, i.e., in the presence of Sr, the selectivity did not decrease with increasing temperature and space time while the conversion increased. In a recent kinetic study, we revealed that the presence of strontium inhibited the consecutive reaction (i.e., oxidation of products). In addition, the same paper addressed the controversy amongst scientists regarding the reaction mechanism at the surface of the catalyst. It was proven that common catalysts such as V-Mo catalyst which has higher reducibility fits well the Mars-Van Krevelen mechanism, while lower reducibility catalysts, such as Sr-V-Mo catalyst, follow Langmuir-Hinshelwood mechanism.

Publikasi :

- ✓ M.D. Putra, S.M. Al-Zahrani and A.E. Abasaeed, *Catalysis Communications*, 14 (2011) 107-110 (ISI, IF=2.986): "Oxidative Dehydrogenation of Propane to Propylene over Al₂O₃-Supported Sr-V-Mo Catalysts".
- ✓ M.D. Putra, S.M. Al-Zahrani and A.E. Abasaeed, *Journal of Industrial and Engineering Chemistry*, 18 (2012) 1153-1156 (ISI, IF=1.977) entitled: "Oxidehydrogenation of Propane to Propylene over Sr-V-Mo Catalysts: Effects of

Reaction Temperature and Space Time”.

- ✓ M.D. Putra, S.M. Al-Zahrani and A.E. Abasaeed, *Catalysis Communications*, 26 (2012) 98-112 (ISI, IF=2.986) entitled: “Kinetic Study of Oxidehydrogenation of Propane over Al₂O₃-Supported Sr-V-Mo Catalysts”.
- ✓ M.D. Putra, M.K. Al-Mesfer, A.E. Abasaeed and S.M. Al-Zahrani, Accepted paper (2013) in *Journal of Chemical Engineering of Japan* (ISI, IF=0.622) entitled: “Oxydehydrogenation of Propane over Supported Nickel-Molybdenum-Oxide Based Catalysts”.
- ✓ M.D. Putra, S.M. Al-Zahrani and A.E. Abasaeed, Accepted paper (2013) in *Journal of Energy Chemistry* (ISI, IF=1.348) entitled: “Effect of Sr loading on Oxidehydrogenation of Propane to Propylene over Al₂O₃-Supported V-Mo Catalysts”.

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Nama : Leonard Wijaya
 Jurusan : Botany and Microbiology
 Jenjang Studi : S-2 (Master)
 Tahun Kelulusan : 2012
 Judul Penelitian : The Effect of Wadi Hanifah Sewage Water and Sediment on Seed Germination and Growth of *Vigna ambacensis* L.

Ringkasan Penelitian :

Wadi Hanifah is considered as one of the most important valleys cutting through the city of Riyadh, Saudi Arabia. In the past 20 years, this wadi was treated as dumping sites of industrial, agricultural and sewage by the people of the city. The pollutants that contained in these matters alter the chemical, physical and biological integrity of the soil and water thereby disrupting the balance of the environment in the wadi which may cause hazardous for the people of the area. Therefore, a study was planned to evaluate the polluting potential of waste water and sediment collected from the different sites of Wadi Hanifah. An additional aim of the present study was to check the suitability of the waste water and sediment to be used as an irrigant and media for the growth and development of the plant. Besides this heavy metal analysis of the crop was also done to check the toxicity at the level of the shoot and root.

The whole study involves the analysis of waste water and sediments collected from the various sites for their physico-chemical characteristics such as dissolved oxygen, surface water temperature, pH, total dissolved solids, salinity, conductivity, biological oxygen demand, Cd, Ni, Pb, and Zn, type of soils and sediment temperature by adopting the standard procedures. The seed germination test was also performed in the seeds of *Vigna ambacensis*. Besides this the plants were grown in the sediments collected from the different sites and the length, fresh and dry weight of root and shoot, chlorophyll and carotenoid content were assessed at two sampling stage to see the suitability of sediments for the growth of the plants.

The results clearly indicate that the waste water collected from the different sites showed higher biological oxygen demand (BOD) level (15.77-22.37 mg/L) as compared to the permissible limit set by the Ministry of water and electricity for unrestricted irrigation of 10 mg/L. The level of cadmium in waste water was also high at most of the

sites (0.004-0.026 ppm) than the standard limit with the exception of site 4. However, the sediment of site 2 contains more Cd (57.95 ppm) as compare to the limit set by the Ministry of Natural Resources and Environment (Cd= 37 ppm). It was noted that the seed germination and radical length of *V. ambacensis* was not affected by the application of waste water, whereas, in the presence of sediment the emergence of radicle was slow up to three days as compare to the control, but in the last (4th& 5th day) there was no significant difference. Most of the growth parameters as well as that of total chlorophyll content was increased in most of the treatment as compared to control, whereas at site 1 it was decreased in the plants of *V. ambacensis*. The reasons for this came from the toxic nature of untreated sewage in sediment itself.

Publikasi : -

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Nama : Alan Soffan
 Jurusan : Plant Protection
 Jenjang Studi : S-2 (Master)
 Tahun Kelulusan : 2012 (saat ini sedang menempuh S-3 di jurusan yang sama)
 Judul Penelitian : Feeding behavior and biological performance of Cowpea aphid, *Aphis craccivora* Koch. (Hemiptera:Aphididae) on Faba bean, *Vicia faba*, L., cultivars

Ringkasan Penelitian :

Cowpea aphid, *Aphis craccivora* Koch., performance on five selected faba bean, *Vicia faba* L., cultivars was evaluated through a biological study, a feeding behavior study and a plant biochemical response study. In biological study, fourteen days period of cowpea aphid colony development study revealed that the cultivar Gazira2 was the least preferred, whereas the cultivar Misr1 was the most preferred. The order of resistance of the cultivars was Gazira2>Misr>Giza3 Improved>Goff1>Misr1. Generally, cowpea aphid infestation significantly inhibited plant growth of infested plants as compared to uninfested ones ($F:41.38$, $P: <0.0001$), except for Gazira2 and Goff1. Further study on some biological parameters justified that Gazira2 was less preferred by the cowpea aphid as compared with Misr1. Longer total aphid longevity and fewer progeny produced were noted either in whole plant or detached leaf. Detached leaf demographic parameters supported the less preferred of Gazira2 compared to Misr1, indicated by significantly lower net reproduction rate (R_o), intrinsic rate of increase (r_m) and finite rate of increase (λ), but longer generation time (T) and doubling time (T_d). These results indicated the occurrence of resistance with antibiosis type in the cultivar Gazira2 as compared to the cultivar Misr1.

Feeding behavior study revealed that the different resistant levels among five faba bean cultivars were not related to phloem tissue factors or leaf surface factor, as indicated by the lack of significance of phloem ingestion duration (E2) and scanning electron microscope (SEM), respectively. Resistance factor in the whole plant of cultivar Gazira2, is suggested because of longer duration of stylet penetration difficulties (waveform F). However, the longer waveform F duration was not retained on detached leaf.

Peroxidase (POD) analysis showed that the cultivar Gazira2 has more POD activity compared to susceptible cultivar Misr1. However it was not inducible, shown by insignificant POD activity value of infested plant compared to uninfested plant. Polyphenol oxidase (PPO) activity on cultivar Gazira2 also was higher than on Misr1. It is suggested that higher activity of POD and PPO in cultivar Gazira2 had a strong relation with longer duration of waveform F (stylet penetration difficulties).

Publikasi :

- ✓ Soffan, A., Aldryhim Y.N. and Aldawood, A.S. 2012. "Effects of Sex Ratio and Pairing Duration on the Biological Performance of Adult Almond Moth, *Ephestiacautella* (Walker) (Lepidoptera: Pyralidae)." *Journal of Agriculture and Urban Entomology*. 28: 25–33.
Online: <http://scentsoc.org/Volumes/JAUE/28/28004.pdf>
- ✓ Soffan, A., Aldryhim Y.N. and Aldawood, A.S. 2012. "Performance of Melon Aphid, *Aphis gossypii* Glover. on Different Host Plants and Different Levels of Nitrogen Fertilizer." *Journal of King Saud University*. Vol. 24. 1-6.
- ✓ Aldawood, A.S., K.G. Rasool, A.H. Alrukban, A. Soffan, M.H. Hussain and K.D. Sutanto. "Temperature Regimens Effect on *Ephestiacautella* (Walker, 1863) (Pyralidae: Lepidoptera) Biology." *Saudi Journal of Biological Sciences* (In review)
- ✓ Soffan, A. and Aldawood, A.S. 2012. "Biology and demographic growth parameters of cowpea aphid, *Aphis craccivora* Koch., on faba bean, *Vicia faba* L., cultivars." *Journal of Insect Science* (In review)
- ✓ Soffan, A. and Aldawood, A.S. 2012. "Cowpea aphid, *Aphis craccivora* Koch. feeding behavior on faba bean, *Vicia faba* L., cultivars using Electrical Penetration Graph (DC-EPG) " (in preparation).
- ✓ Soffan, A. Alghamdi S.S. and Aldawood, A.S. 2012. "Peroxidase and polyphenol oxidase activity in moderate resistant and susceptible faba beans, *Vicia faba* L., induced by cowpea aphid, *Aphis craccivora* Koch., infestation." *Journal of Insect Science* (In review)

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Nama : Mujtahid Kavessina
 Jurusan : Chemical Engineering
 Jenjang Studi : S-3 (Doktor)
 Tahun Kelulusan : 2013
 Judul Penelitian : Synthesis and Characterization of Biodegradable Poly (Lactic Acid) and Its Engineering Application

Ringkasan Penelitian :

Poly (lactic acid) is one of the thermoplastic aliphatic polyesters with excellent properties comparable to many petroleum-based plastics (polystyrene, polyethylene, etc.). Its monomer is lactic acid derived from renewable resources. It is also readily degradable under hydrolytic, thermal conditions or in an enzymatic or bacterial atmosphere. Conversely, it has some drawbacks which limit its application in a wide range, i.e.: very brittle and stiff, hydrophobic and processing instability. Therefore, much attention was also paid by researchers to develop the new properties of PLA in special engineering application.

This research work has been focused on utilization of the local Saudi dates, especially low grade of dates, for producing high valuable polymers (poly (lactic acid)). It has been divided into three parts: (a) synthesis of lactic acid from abundantly available dates in Kingdom of Saudi Arabia, (b) polymerization of lactic acid to produce high molecular weight poly (lactic acid) via direct Polycondensation, and (c) characterization and modification of poly (lactic acid) to tailor its new properties via melt and solvent blending techniques.

In the first part of this research work, we explored some potentials of date to be utilized as an abundantly renewable resource of lactic acid production, especially in Kingdom Saudi Arabia. *Lactobacillus casei* ATCC 393 was employed as a fermentative organism to convert sugars from date juice into lactic acid. It could ferment simultaneously both glucose and fructose directly without any pre-treatment and produce lactic acid in submerged fermentation. Although some protein and minerals were contained in date, it was required to add some supplements during the fermentation for bacterial growth, especially nitrogen sources to enhance the productivity of lactic acid. In this batch fermentation, the effects of yeast extract and date juice concentration on

bacteria growth was monitored. By adding yeast extract about 20g/l in the date juice medium, the maximum specific growth rate of bacteria (μ_m) enhanced from 0.123 to 0.182 g/l. While the increasing date juice concentration from 86.69 to 158.92 and 229.54 g/l enhanced the μ_m value from 0.18 to 0.21 and 0.19 g/l, respectively. It indicated that the presence of an optimum value for μ_m is 0.211 g/l in this concentration range. In the date juice concentration of 158.92 g/l, the optimum lactic acid can be produced at 117.83 g/l with yield of 94.15% for 48 hrs.

In the second part of this research work, poly (lactic acid) was synthesized via direct polycondensation in m-xylene solution. Stannous chloride was employed as a catalyst with different treatments prior to be used. The impregnation SnCl_2 into $\gamma\text{-Al}_2\text{O}_3$ showed the best performance that produces high average molecular weight (M_w) of poly (lactic acid) about 104,392 Da. This $\text{SnCl}_2/\gamma\text{-Al}_2\text{O}_3$ has also been successfully grafting obtained poly (lactic acid) chains into glycerol supported by hexamethyl diisocyanate (HDMI). The grafted poly (lactic acid) had an average molecular weight three times higher than that of obtained poly (lactic acid). Infra red spectra showed that the poly (lactic acid) can be produced using this synthesis technique and has molecular structure arranged mainly in amorphous phases. The maximum degree of crystallinity was found at 12.91% (calculated from DSC data) or 14.56 % (measured using an XRD) for obtained poly (lactic acid) with catalyst $\text{SnCl}_2/\gamma\text{-Al}_2\text{O}_3$. The catalyst can be withdrawn by extraction using chloroform as a solvent. IR spectra and XRD diffractograms showed there were no catalysts in produced samples of PLA.

In the last part of this research work, bulk modification of poly (lactic acid) was done by introducing it with biodegradable elastomer via melt blending and hydroxyapatite via solvent blending. Generally, both elastomer and hydroxyapatite tended to increase the biodegradability of poly (lactic acid). SEM micrographs showed that the degradation began at the surface and mainly occurred in amorphous parts. Different effect on mechanical properties was monitored. Poly (lactic acid) became more elastic by adding elastomer and stiffer by adding hydroxyapatite. The elastic modulus and tensile strength decreased severely due to the presence of elastomer. Thermal stability tended to enhance as an increase of hydroxyapatite.

Publikasi :

- ✓ Mujtahid Kaavessina, Ilias Ali, Rabeh Elleithy, Saeed M. Alzahrani, "Crystallization behavior of poly (lactic acid)/elastomer blends", *Journal of Polymer Research*, vol.

19, issue 2, pp. 1-12, 2012

- ✓ Mujtahid Kaavessina, Ilias Ali, Saeed M. Alzahrani, “The Influences of Elastomer toward Crystallization of Poly (lactic acid)”, *Procedia Chemistry*, vol. 4, pp. 164-171, 2012,
- ✓ Mujtahid Kaavessina, Imtiaz Ali, Saeed M. Alzahrani, “In-vitro biodegradability of poly (lactic acid)/hydroxyapatite biocomposites prepared by solvent-blending technique”, *Advanced Materials Research*, vol. 626, pp. 631-635, 2013
- ✓ Mujtahid Kaavessina, Ilias Ali, Rabeh Elleithy, Saeed M. Alzahrani,” Preparation and characterization of poly (lactic acid)/elastomer blends prepared by melt blending technique, *Journal of Plactics and Elastomer* (IN PRESS, first online on January 3, 2013)

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Nama : Abdur Rosyid
Jurusan : Mechanical Engineering
Jenjang Studi : S-2 (Master)
Tahun Kelulusan : (sedang menempuh)
Judul Penelitian : Vibration Intelligent Control of a Reduced-order Finite Element Model of a Rotor – Journal Bearing System
Ringkasan Penelitian :

Vibration is a problem of perpetual concern in rotating machinery due to its central role in the machinery performance, safety, and reliability. With the need of the rotating machinery to rotate at higher speeds, there will be more kinetic energy involved, and therefore more potential to excessive vibrations. The vibrations may occur due to instability or excitations. Imbalance, which is the most common cause of excessive vibration in rotating machinery, mainly causes lateral vibration.

To suppress the vibration, passive control methods have been used. However, it has many limitations. Hence, active (including semiactive) control have been developed. Among the active control methods, optimal control such as Linear Quadratic Regulator (LQR) technique has been widely used due to its advantages over pole placement method. Intelligent control also has been recently proposed to get better control performance. Many works have been conducted to investigate the implementation of intelligent control in rotor system with magnetic bearings. However, such works are still rarely conducted for rotor system with conventional actuators such as active journal bearings.

To model the rotordynamic system to be controlled, most control design have used lumped parameters model. Finite element model, which offers higher accuracy, has been recently used in the design of rotordynamic control. However, it involves high degrees of freedom and therefore needs higher cost for control design. To take the advantage of the finite element model accuracy, various model reduction methods have been proposed for rotordynamic control design. A good model reduction method should compromise the cost by reducing the model without significantly reducing the accuracy.

This study is aimed to implement fuzzy learning control technique, one of the intelligent control techniques, to reduce vibration of rotor-journal bearing system. An

LQR controller design scheme will be proposed, and fuzzy supervisor will be developed in order to smooth the switching due to changing of weighted matrices Q and R in the LQR controller. The algorithm should explore the cooperation between the fuzzy controllers, knowledge, and learning data to improve the outputs of the LQR controller. A reduced-order finite element model of the rotor-journal bearing system will be used in the analysis and design.

Publikasi : -

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Nama : Wahyudin Permana Syam
 Jurusan : Industrial Engineering
 Jenjang Studi : S-2 (Master)
 Tahun Kelulusan : 2011
 Judul Penelitian : A New Application of Electron Beam Melting for Coping of Dental Metal-Ceramic Crown Restoration

Ringkasan Penelitian :

This study presents a novel application of electron beam melting (EBM), as layered manufacturing process, to fabricate dental coping of metal-ceramic crown restoration (MCC) using Ti6Al4V powder. In MCC, there are two layers building up the restoration. First layer is metal coping, a thin-walled structure that supports the crown restoration. Second is porcelain crown restoration for aesthetic as the restored tooth. The characteristics of metal coping are small size and a thin-walled structure. These characteristics become a challenge for EBM process since EBM process uses very high energy density which can destroy a small and thin-walled part compared to Selective Laser Melting (SLM) process.

The experimental works were conducted in two steps:

- 1) The first is shrinkage study to determine scale up factor for shrinkage compensation of Ti6Al4V coping. In shrinkage study, virtual coping with a cone shape was designed. Subsequently, the designed virtual copings were fabricated by EBM and measured in two predefined dimensions: bottom inner diameter and depth by Coordinate Measuring Machine (CMM). From this study, scale up factors were obtained for X-Y- and Z-direction which are 1.04279 and 1.06215 respectively.
- 2) The second is parameter selection study to select optimum process parameters of electron beam melting that affect thickness, hardness, and surface roughness. The process parameters considered in the experiments were Focus Offset, Beam Current, Beam Speed, and Energy Density. From this study, process parameters for operation of rapid manufacturing machine which fabricate the coping were selected which were Focus Offset of 15 mA, Beam Speed of 800 mm/s and Beam Current of 3 mA. These parameters produced energy density of 0.998 J/mm²

Hence, coping design processes for fabrication were carried out through

several steps:

- 1) After obtaining coping die from dentist, a model of a coping die was obtained from scanned data by laser scanning process in Stereotype lithography (STL) file format to develop a graphical surface model of the scanned die.
- 2) The graphical surface model in STL file format was modified to remove unnecessary region of the surface model so that the required surface model of the die was obtained for the coping design. Subsequently, a thickness was added to the surface model of the coping to get a complete 3D solid model of the coping in STL format.
- 3) Finally, the 3D solid model of the coping was used for fabrication by rapid manufacturing machine using EBM method. The STL file format model was prepared to set the orientation and position of the parts on the base plate.

The results of fabricating metal coping of Ti6Al4V via electron beam melting show a promising process to fabricate copings and they were successfully fabricated with average thickness of 0.52 mm and average hardness of 333.35 HV satisfying the dentist requirement. However, the surface roughness is still high and in average of RSm 382 μm or Ra 27 μm . Subsequently, polishing process was applied to reduce the surface roughness.

For metallographic analyses, two predefined location for analysis which are north and south region of the cross section were determined by cutting the coping in the middle. From metallographic observation, there was no porosity found in microstructure analysis using Scanning Electron Microscopy (SEM) and Light Optical Microscope (LOM). Titanium-Oxide of TiO₂ was not observed in X-Ray Diffractometry (XRD) spectra analysis.

Mechanical tests, which are tensile test, impact test, and three-point flexural test, were carried out. The results of tensile test, impact test, and three-point flexural test are 679.233 MPa, 204.82 J, and 29.671 GPa respectively. These results are below the standard value of mechanical properties of cast Ti6Al4V, but still conform to the strength requirements of the coping.

Finally, from a basic fabrication cost comparison study, in-house coping fabrication by using EBM is cheaper as well as significantly reduces processing time and results on faster delivery time.

Publikasi : -

- ✓ Wahyudin P. Syam, M. A. Mannan, A. M. Al-Ahmari, (2013) "Fabrication of

Ti6Al4V Thin-walled structure by EBM", To be submitted

- ✓ A. Bouras, Wahyudin P. Syam. (2013). "Hybrid chaos optimization algorithm and affine scaling search for solving linear programming problem", *Applied Soft Computing*, in press.
- ✓ Wahyudin P. Syam, H. A. Al-Shehri, A. M. Al-Ahmari, K. A. Al-Wazzan, M. A. Mannan. (2012). "Preliminary fabrication of thin-wall structure of Ti6Al4V for dental restoration by electron beam melting". *Rapid Prototyping Journal*, Vol. 18, No. 3, pp. 230-240.
- ✓ Wahyudin P. Syam, M. A. Mannan, A. M. Al-Ahmari. (2011). "Rapid Prototyping and Rapid Manufacturing in Medicine and Dentistry", *Virtual and Physical Prototyping*, Vol. 6, No. 2, pp. 79-109.
- ✓ Wahyudin P. Syam, I. M. Al-Harkan. (2012). "Improvement and comparison of three meta heuristics to optimize flexible flow-shop scheduling problems", *International Journal of Engineering Science and Technology*, Vol. 4, No. 1, pp. 373-383.
- ✓ Wahyudin P. Syam, I. M. Al-Harkan. (2010). "Comparison of three meta heuristics to optimize flexible flow-shop scheduling problems with parallel machines", *World Academy of Science, Engineering, and Technology*, Vol. 62, pp. 271-278.
- ✓ H. Susanto, M. N. Al-Munawwar, Wahyudin P. Syam, Y. C. Tuan, H. Bakry. (2011). "I-SolFramework view on ISO27001", *Asian Transaction on Computers*, Vol. 1, No. 3, pp. 1-10.
- ✓ H. Susanto, M. N. Al-Munawwar, Y. C. Tuan, M. S. Aksoy, Wahyudin P. Syam. (2011). "Integrated solution modeling software: A new paradigm on information security review and assesment", *International Journal of Science and Technology*, Vol. 1, No. 10, pp. 90-99.
- ✓ Wahyudin P. Syam, A. M. Al-Ahmari, M. A. Mannan, H. A. Al-Shehri, K. A. Al-Wazzan. (2011). "Metallurgical, accuracy, and cost analysis of Ti6Al4V dental coping fabricated by electron beam melting process", *Proceeding of International Conference of Advance Research in Virtual and Physical Prototyping (VRAP 2011)*, 28 September – 1 October 2011, Leiria, Portugal.
- ✓ H. Susanto, F. B. Muhaya, M. N. Al-Munawwar, M. S. Aksoy, Wahyudin P. Syam. (2010). "STOPE view on ISO/IEC 27001", *Proceeding of IEEE International Conference on Future Information Technology and Computing (FITC 2010)*, 9-10

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Jenjang Studi : S-2 (Master)
Tahun Kelulusan : 2013
Judul Penelitian : The Calliphoridae, The Blow flies (Diptera: Oestroidea) of Kingdom of Saudi Arabia

Ringkasan Penelitian :

The identification of adults of the Calliphoridae (Diptera: Oestroidea) or blowflies is important in regard to sanitary biology, medical, veterinary, and forensic entomology. No comprehensive study of the Calliphoridae for the Kingdom of Saudi Arabia is currently available. An examination of 2,211 specimens examined from June 2010-June 2012 and the literatures indicated at least 34 species of Calliphoridae are known from Saudi Arabia. Four species represent new country records, *Pericallimyia greatheadi*, *Pollenia hungarica*, *Rhyncomya sinaiensis* and *Rhyncomya zumpti*. Keys and illustrations are presented to allow determination of the adults of the 34 species. Additionally, distribution maps for these species in Saudi Arabia are provided.

Publikasi : -

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 Tahun Kelulusan : 2013
 Judul Penelitian : Particle-Initiated Partial Discharge Detection in Gas-Insulated Substation

Ringkasan Penelitian :

SF_6 Gas-Insulated Substation (GIS) is widely used in power industry due its many advantages over Air-Insulated Substation (AIS). However, the reliability of GIS may be reduced due to the presence of metallic particles. Indeed, such particles that are initially free move towards higher electric field regions such as triple junctions, i.e. spacer-electrode-gas interface. When these particles reach the insulating spacer, they adhere to the spacer surface due to electrostatic image forces. The presence of such metallic particles in this region significantly affects the dielectric performance of the system. They constitute weakest regions at which the local electric field is enhanced resulting in partial discharges (PDs), the intensification and development of which can lead to the insulation failure. The PD signals are shaped by particle size and position on the spacer surface.

The effects of different particle sizes at different positions were intensively investigated in this thesis. Simulation using Ansys Maxwell software was done to observe the electric field in the studied GIS system. The results are useful for determining the region with the highest likelihood of PD occurrence. Subsequently, experimental works were carried out in HV laboratory to confirm the dependence of PD characteristics on particle size and position at various SF_6 pressures by utilizing calculated total PD magnitude and phase-resolved partial discharge (PRPD) pattern (ϕ - q characteristics).

The main contribution of this thesis is the proposed methods for estimating particle size and position on the spacer surface using “recognition rate” and Back Propagation Artificial Neural Network (BP-ANN) techniques. These techniques work by recognizing PD signal patterns acquired from the measurements. The PD signals fed into both of these techniques were represented by “fingerprint”, which is the collection of statistical

operators quantitatively describing the characteristics of various PD distributions. MATLAB software was used to implement the developed methods. The evaluation revealed that both of these techniques performed well in estimating particle size and position at various SF₆ pressures. An accuracy of 86% could be reached by “recognition rate” technique, while BP-ANN achieved 92% accuracy of recognition.

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 Judul Penelitian : Preparation and Investigation of the Electrocatalytic Activity of Platinum Coated TiO₂ Nanotube Arrays

Ringkasan Penelitian :

تحضير ودراسة النشاط التحفيزي الكهربائي لمصفوفات أكسيد التيتانيوم النانوية المطلية بالبلاينيوم يكتسب ثبات وطول عمر البلاينيوم الحفاز المدعوم على الكربون أهمية كبيرة في العديد من التطبيقات، إلا أن الكربون طول مع زيادة زمن الاستخدام يتآكل مما يؤدي إلى نقص كفاءة الحفار. لذا فإن الحاجة ملحة لمادة داعمة مقاومة للتآكل. وتعتبر مادة أكسيد التيتانيوم بديلاً واعداً عن الكربون لاستخدامه مادة داعمة للبلاينيوم الحفاز. كما أن مادة أكسيد التيتانيوم من أكثر المواد الكيميائية التي جرت دراستها وذلك لتعدد تطبيقاتها في مجالات مختلفة. ويمكن تشكيلها على شكل تراكيب نانوية متعددة الأشكال مثل الأنابيب النانوية بحيث تستخدم مادة داعمة للعديد من التطبيقات الكهروحفزية. كما تتميز أنابيب أكسيد التيتانيوم النانوية بالانتظام الطولي والترتيب الشبكي المنتظم مع كبر مساحتها السطحية وثباتها في بيئات حمضية وقاعدية مختلفة. ويتم تحضير أنابيب أكسيد التيتانيوم النانوية بطرق مختلفة منها التحضير الحراري المائي في بيئة قاعدية، التحليل الكهربائي، والترسيب المدعوم بالقلب، ومن بين هذه الطرق أثبتت طريقة التحليل الكهربائي في بيئة حمض الهيدروفلوريك وفي ظروف تحضير مضبوطة أنها طريقة فعالة وقليلة التكاليف لتحضير أنابيب نانوية منتظمة وعالية التناسق من أكسيد التيتانيوم، مع إمكانية التحكم بالأبعاد المسامية للأنابيب.

في هذا البحث، جرى تحضير أنابيب أكسيد التيتانيوم النانوية بطريقة التحليل الكهربائي الكهروكيميائي لرقاقات معدن التيتانيوم في محلول إلكتروليتي ذي نسبة وزنية 0.5% من حمض الهيدروفلوريك، عند جهد كهربائي 20 فولت ولمدة 20 دقيقة. ثم إجراء تصليب حراري للأنابيب المحضرة بالتسخين في الظروف الجوية العادية ليتم استخدامها مادة داعمة لحبيبات البلاينيوم النانوية الحفازة والذي تم ترسيبها على الأنابيب المحضرة بطريقة الترسيب الكهربائي ذي الجهد الثابت والنمطي. تم أيضاً في هذا البحث ضبط ظروف التحضير بحيث يتم ترسيب حبيبات بلاينيوم نانوية بتوزيع وتشتت أفضل، ومعامل خشونة أعلى، وتوزيع حجمي منتظم للحبيبات. تم بعد ذلك دراسة النشاط الكهروكيميائي والثبات الزمني والخصائص الفيزيائية لحبيبات البلاينيوم النانوية باستخدام الفولتامترية الدورانية، طيف الانبعاث الضوئي للبلازما المستحثة كهربياً، والمجهر الإلكتروني الماسح. جرى اختبار النشاط الحفزي الكهربائي لنظام حبيبات البلاينيوم النانوية/أنابيب أكسيد التيتانيوم النانوية بقياس مدى اختزال الأكسجين في محلول 0.5 M H₂SO₄ باستخدام تقنية الفولتامترية الدورانية. أشارت نتائج التحليل بالتقنيات المذكورة أعلاه إلى أن حبيبات البلاينيوم النانوية المترسبة كانت ذات توزيع منتظم وبمستوى تشتت عالٍ على سطح الأنابيب النانوية لأكسيد التيتانيوم. كما أن الأداء الكهروحفزي لهذا النظام (حبيبات البلاينيوم النانوية/أنابيب أكسيد التيتانيوم النانوية)

في قياسات اختزال الأكسجين يجعل منه نظاماً واعداً لتطبيقات خلايا الوقود
الكلمات المفتاحية: التحليل الكهربائي، أنابيب أكسيد التيتانيوم النانوية، الترسيب الكهربائي، حبيبات البلاتينيوم
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 Judul Penelitian : Experimental Study of Forced Convection and Pressure Drop of CuO-water Nanofluid Flowing in a Heated Tube

Ringkasan Penelitian :

In the past decades, researchers observed the phenomena of higher thermal conductivity as well as heat transfer of various nanofluids compared to that of their base fluids. Interestingly, some researchers have found that nanofluids showed an anomalous and unprecedented increase in heat transfer compared to that of their base fluids which was not merely due to the increase in their effective thermal conductivity. However, some others have found that the increase was normal and predictable. Therefore, in order to contribute resolving this issue, turbulent forced convective heat transfer and pressure drop of 0.01 vol.% and 2.16 vol% CuO-water nanofluid were assessed experimentally.

In order to achieve the aforementioned goal, characterization of the nanofluid was carried out. The thermal conductivity was estimated to increase 8.45% based on Chen et al.'s method [Particuology 7 (2009) 151–157] while, on the other hand, the measured viscosity showed high increase of 48% and 33% at 8.7°C and 50°C, respectively. It was found that from 8.7°C to around 30°C the ratio of viscosity of the nanofluid to that of water decreased while from 30°C to 50°C, nearly constant value was observed. Aggregates formation was also evident as the nanofluid's average particle-size measured in its liquid form gave values around 6 times of that of the single / individual particle observed by electron microscope on the nanofluid dried sample as well as manufacturer's statement.

Upon completing the characterization phase, experiments on heat transfer and pressure drop were conducted. The nanofluids were allowed to flow inside a heated horizontal tube under constant uniform heat flux within turbulent flow condition. The first objective is to know how close well-known existing correlation/formula for, both, heat transfer and pressure drop can predict nanofluid's heat transfer and pressure drop. The second is to know how nanofluid's convective heat transfer and pressure drop are

compared to those of its base fluid; in this case water. The results showed that the abovementioned characteristics of the nanofluid can be predicted by the traditional correlation available to within 10%. Hence, there is not any anomalous change in heat transfer and pressure drop characteristics of these particular nanofluids compared to their base fluid (water). Thus, efficacy / effectiveness estimate of nanofluids usage as replacement to the existing heat transfer fluids such as water, ethylene glycol, and oil, can be done based on the comparison of thermophysical properties of the nanofluids and its basefluids in conjunction with the available correlations / equations for heat transfer and pressure drop under required flow conditions.

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 Judul Penelitian : Novel Low SAR Quad Band Antenna
 Ringkasan Penelitian :

Penelitian ini bertujuan untuk menghasilkan struktur antenna baru yang dipergunakan di handset yang dapat bekerja di seluruh frekuensi komunikasi dan memiliki nilai Specific Absorption Rate (SAR) terendah sehingga meminimalisir dampak negatif terhadap kesehatan penggunaanya.

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